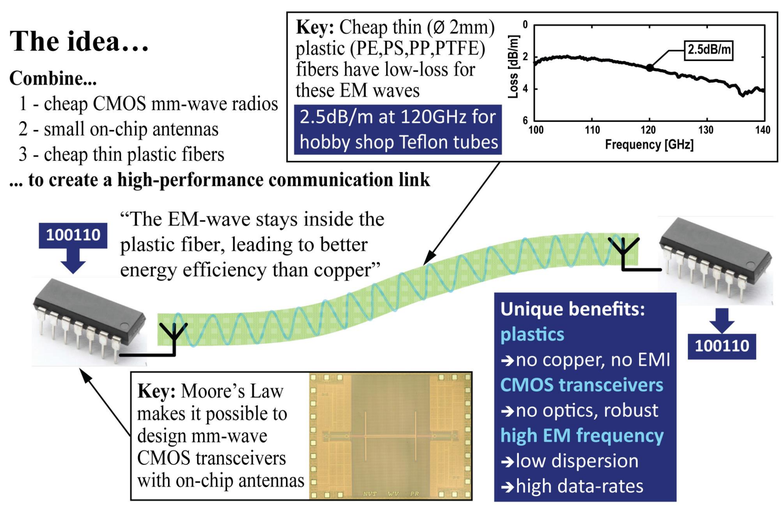
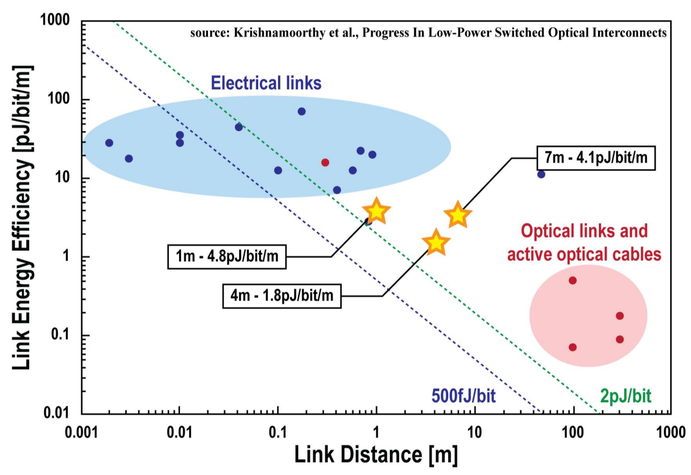
Campeon Innovation Week 2015
University Evening

A Multigigabit Polymer Microwave Fiber (PMF) Communication Link in 40nm CMOS

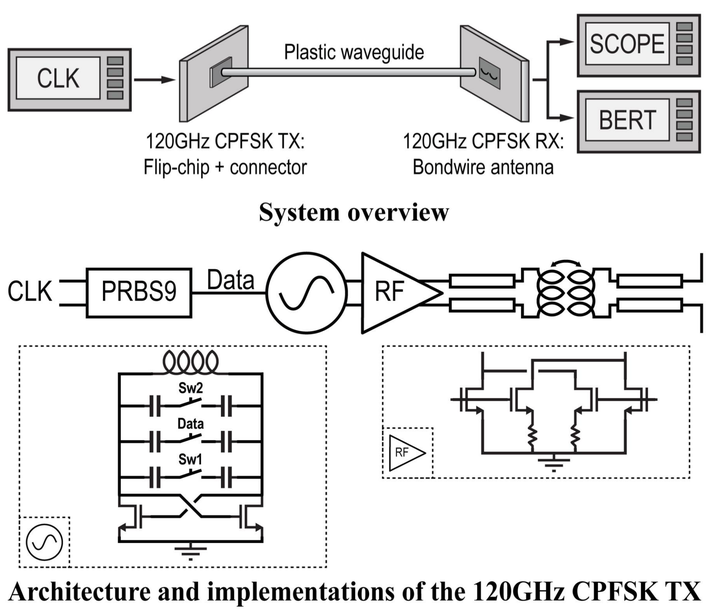
Introduction



Motivation

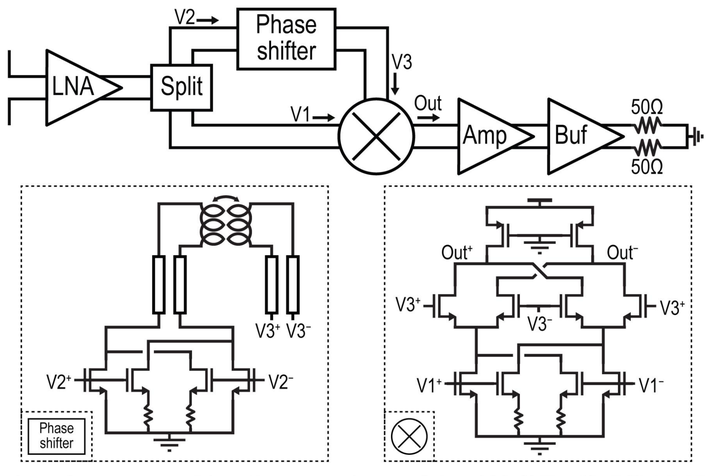


FSK TX architecture



Architecture and implementations of the 120GHz CPFSK TX

FSK RX architecture



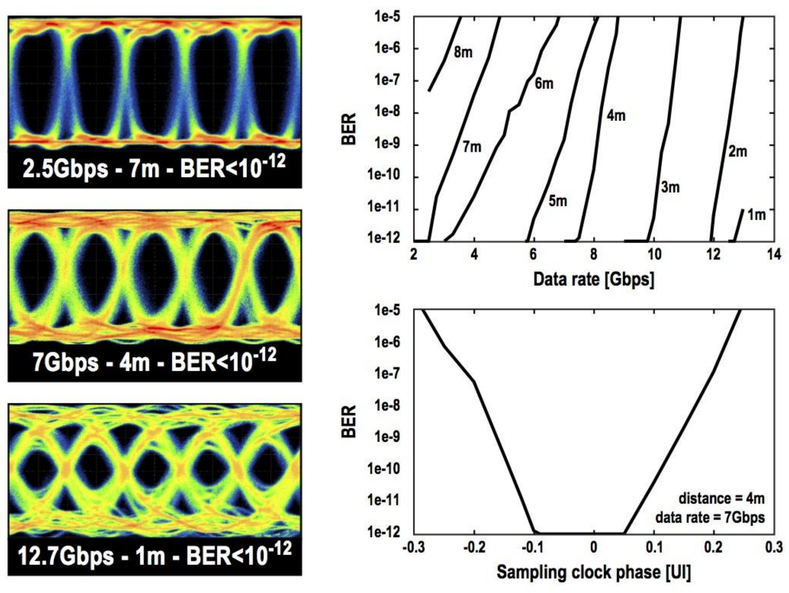
Architecture and implementations of the 120GHz CPFSK RX

Comparison to state-of-the-art

	[1] ISSCC '11	[2] JSSC '11	[3] MWCL '13	[4] ESSCIRC '13	This work
Technology	40nm CMOS	40 nm CMOS	65nm CMOS	40nm CMOS	40nm CMOS
Supply [V]	1.1	1.1	1	0.9	0.9
Carrier Frequency [GHz]	80	57	60	87	120
Material	PS	PS	PTFE	PP	PTFE
Geometry	Filled, Rectangular	Filled, Rectangular	Hollow, Circular	Filled, Rectangular	Hollow, Circular
Dimensions	1.1mm x 8mm	1.1mm x 8mm	Ø 3.2mm x Ø 2.6mm	0.9mm x 2.2mm	Ø 2mm x Ø 1mm
Distance [m]	0.12 / 1	0.1 / 1	2 / 7.6	0.6 / 9	1 / 4 / 7
Rate [Gbps] (BER 10^{-12})	12.5 / 4.3	15 / 10	6 / 3.3	9 / 2.5	12.7 / 7.4 / 2.5
Rate x Dist. [Gbps.m]	1.5 / 4.3	1.5 / 10	12 / 25.1	5.4 / 22.5	12.7 / 29.6 / 17.5
FOM [pJ/bit/m]	48 / 16.7	47.3 / 7.1	2.3 / 1.1	9.3 / 2.2 (RX only)	4.8 / 1.8 / 4.1
Active area [mm^2]	0.06(TX)+0.14(RX)	0.07(TX)+0.14(RX)	0.06(TX)+0.08(RX)	0.21 (RX only)	0.03(TX)+0.45(RX)
Antenna	Quasi-Yagi on PCB	Quasi-Yagi on PCB	Off-chip dipole bondwire	On-chip dipole bondwire	On-chip twisted dipole On-chip dipole bondwire
Modulation technique	ASK	ASK	ASK	Multilevel ASK	CPFSK
Bending radius [mm]	N/A	N/A	N/A	N/A	25

Meas. results

Measured eye diagrams, BER and eye opening.
No DFE or error correction is applied on the receiver side.



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